

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Serial No.:

Group Art Unit:

Inventors: Arman et al.

Filed: Concurrently

Title: Superconducting Magnet System With
Supplementary Heat Pipe Refrigeration

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

In accordance with 37 CFR 1.51, 1.56 and 1.97 to 1.99, the following is a relevance statement on each citation listed on attached form PTO-1449, and is made of record to assist the Patent & Trademark Office in its examination of this application:

U.S. 4,680,936 – Sarwinski et al. discloses a cryogenic magnet system for use in MRI devices comprising an electromagnet immersed in a first tank located in an evacuated container and a refrigerating system external to the evacuated container which includes a gas and means for liquefying the gas. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 4,782,671 – Breneman et al. discloses an MRI magnet system wherein the magnet is housed in a vacuum vessel and a cryogenic refrigerator is supported by the vacuum vessel and extends inside. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 4,924,198 – Laskaris discloses a superconductive magnet for magnetic resonance imaging positioned within a housing with a multiple stage cryocooler mounted in the housing with one stage of the cryocooler thermally coupled to a radiation shield and with another stage thermally coupled to heat conductive means. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,374,617 – Bonaquist et al. discloses a pulse tube system wherein a product fluid such as hydrogen is preferably precooled and then liquefied, subcooled and/or densified by heat exchange with ultra cold gas generated by a pulsing compression wave which rejects heat into a cryogen fluid heat sink. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,640,553 – Kotsubo et al. discloses a pulse tube refrigeration system having a pulse generator, a regenerator and a pulse tube, comprising a tapered work transfer tube interposed between the pulse generator and the regenerator. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

U.S. 6,544,038 – Acharya et al. discloses a pulse tube refrigeration system wherein the pulse tube working gas is cooled to a defined first stage temperature and is brought to a defined second state temperature by operation of a regenerator and pulse tube, which are in flow communication through a cold heat exchanger, prior to providing

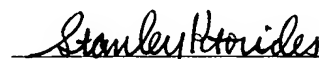
refrigeration to a high temperature superconduction. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

Advanced Cryocooler Cooling For MRI Systems – Ackermann et al. describes the impact that certain cryocooler developments have had on MRI systems. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

Cryogenic Refrigerator Evaluation For Medical And Rotating Machine Applications – Ackermann et al. describes an evaluation performed after an apparent failure of a large number of refurbished cryocoolers. There is no disclosure of a superconducting magnet system wherein a cryocooler provides refrigeration to a cryogenic shield for the superconducting magnet and a heat pipe extends from the cryogenic shield to a cryogen vessel for the provision of supplementary refrigeration, and thus this reference neither discloses nor suggests applicants' claimed invention.

A copy of each of the non-patent citations is enclosed herewith.

Respectfully submitted,



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Serial No.

Information Disclosure Citation

(Use several sheets if necessary)

Applicants
Arman et al.

Filing Date

Group

U.S. PATENT DOCUMENTS

Examiner Initial	Document Number								Date	Name	Class	Subclass	Filing Date if Appropriate
		4	6	8	0	9	3	6	7/1987	Sarwinski et al.	62	45	
		4	7	8	2	6	7	1	11/1988	Breneman et al.	62	514	
		4	9	2	4	1	9	8	5/1990	Laskaris	335	216	
		6	3	7	4	6	1	7	4/2002	Bonaquist et al.	62	6	
		6	6	4	0	5	5	3	11/2003	Kotsubo et al.	62	6	11-20-02
		6	6	4	4	0	3	8	11/2003	Acharya et al.	62	6	11-22-02

FOREIGN PATENT DOCUMENTS

Document Number								Date	Country	Class	Subclass	Translation	
												Yes	No

Other Documents (including Author, Title, Date, Pertinent Pages, Etc.)

			Ackermann et al., "Advanced Cryocooler Cooling for MRI Systems", Cryocoolers 10 (1999) pp 857-867
			Ackermann et al., "Cryogenic Refrigerator Evaluation for Medical and Rotating Machine Applications", Cryocoolers 12 (2003) pp 805-811

Examiner

Date Considered

* EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.